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Veröffentlichungsversion / Published Version
Zeitschriftenartikel / journal article

Empfohlene Zitierung / Suggested Citation:

Waldrigues, M. C., Wagner, B. V., Mercês, N. N. A. d., , Almeida, E. A. d., & Caveião, C. (2014). Complications in therapeutic hypothermia: diagnosis and interventions. *Revista de Pesquisa: Cuidado é Fundamental Online*, 6(4), 1666-1676. <https://doi.org/10.9789/2175-5361.2014.v6i4.1666-1676>

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Federal University of Rio de Janeiro State

Journal of Research Fundamental Care Online

ISSN 2175-5361
DOI: 10.9789/2175-5361

SYSTEMATIC REVIEW OF LITERATURE

Complicações da hipotermia terapêutica: diagnósticos e intervenções de enfermagem

Complications in therapeutic hypothermia: diagnosis and interventions

Complicaciones de la hipotermia: los diagnósticos y las intervenciones de enfermería

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ABSTRACT

Objective: To identify nursing diagnoses according to the NANDA, upon the potential complications of patients undergoing Therapeutic Hypothermia after Cardiorespiratory arrest and propose nursing interventions, according to the Nursing Interventions Classification (NIC). **Method:** this is a bibliometric review of the literature from January 2003 to May 2013, in LILACS, MEDLINE, and SCIELO. **Results:** Five articles selected, which enabled us to identify eight Nursing diagnoses, as well as the corresponding nursing interventions. **Conclusion:** Despite the high efficacy of Therapeutic Hypothermia to reduce the extent of neurological damage Post-Cardiopulmonary arrest, their use is not as widespread in clinical practice. Thus, this research has aimed to provide an initial basis for considering the practice of the professional nurse assisting this patient. **Descriptors:** Induced hypothermia, Heart arrest, Nursing, Nursing processes, Continuity of patient care.

RESUMO

Objetivo: Identificar os diagnósticos de enfermagem, segundo a NANDA, mediante as complicações potenciais dos pacientes submetidos à Hipotermia Terapêutica Pós-Parada Cardiorrespiratória e propor as intervenções de enfermagem, conforme a Classificação de Intervenções de Enfermagem (NIC). **Método:** trata-se de uma revisão bibliométrica de literatura a partir de janeiro de 2003 até maio 2013, nas bases de dados LILACS, MEDLINE e SCIELO. **Resultados:** foram selecionados 5 artigos, os quais possibilitou identificar 8 diagnósticos de Enfermagem, bem como, as intervenções de Enfermagem correspondentes. **Conclusão:** apesar da alta eficácia da Hipotermia Terapêutica em reduzir a extensão do dano neurológico Pós-Parada Cardiorrespiratória, sua utilização não é tão ampla na prática clínica. Dessa forma, esta pesquisa tem intuito de fornecer uma base inicial de reflexão para a prática do profissional enfermeiro que assiste este paciente. **Descritores:** Hipotermia induzida, Parada cardíaca, Enfermagem, Processos de enfermagem, Continuidade da assistência ao paciente.

RESUMEN

Objetivo: Identificar los diagnósticos de enfermería según la NANDA, sobre las posibles complicaciones de los pacientes sometidos a Hipotermia Terapéutica Después Parada cardiorrespiratoria y proponer intervenciones de enfermería, de acuerdo con la Clasificación de Intervenciones de Enfermería (NIC). **Método:** se trata de una revisión bibliométrica de la literatura entre enero de 2003 mayo de 2013, en LILACS, MEDLINE y SCIELO. **Resultados:** 5 artículos fueron seleccionados, lo que nos ha permitido identificar 8 Diagnósticos de enfermería, así como las intervenciones de enfermería correspondientes. **Conclusión:** A pesar de la alta eficacia de la hipotermia terapéutica para reducir la magnitud del daño neurológico post-paro cardiopulmonar, su uso no está tan extendido en la práctica clínica. Por lo tanto, esta investigación ha tenido como objetivo proporcionar una base inicial para la consideración de la práctica de la enfermera profesional asistiendo a este paciente. **Descriptor:** Hipotermia inducida, Paro cardíaco, Enfermería, Procesos de enfermería, Continuidad de la atención al paciente.

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INTRODUCTION

For expertise in nursing, nurses need to recognize and understand your work process, it consists of a series of work processes, which may or may not be executed concurrently, they are: the worker process Watch, the worker process Manage, Teach, work process the process of job Search and the work process to participate Politically.¹

However, to better understand the work process, it is necessary to consider that it is composed of a series of elements, namely: object being what works, agent are humans that transforms nature, instrument used by the agent to change the object, the reason purposes is made the product, methods the actions organized in order to fulfill the purpose, and the products that are expected to achieve.¹

In this study, the focus was the worker process watch the patient subjected to hypothermia therapy (HT) cardiorespiratory post-arrest (PCR), where the elements have the following meaning: object-individual care; agents - nurses, technicians and nursing assistants; instruments - structured knowledge, skills, attitudes, materials, equipment and physical structure; purpose - to promote, maintain and restore health; methods-Systematization of nursing care and nursing procedures and products - healthy individual or death with dignity.¹

In this context, highlight that the element "method"-path by which the nurse sets as will be the individual, this professional has two essential tools regulated by COFEN Resolution No. 358/2009, which contributes to the care organization, the Systematization of nursing care (SAE) and nursing process (PE), because both allow you to identify, understand, describe, and predict the needs of being careful.²

The SAE organizes the professional work regarding the method, personnel and instruments, making it possible for the operationalization of the EP, which consists of a methodological instrument that guides the nursing professional care and documentation of professional practice, which is organized into five interrelated, interdependent and recurring steps, they are: history of nursing, nursing diagnosis, planning, implementation and evaluation of nursing nursing.³

Therefore, nurses must draw a care plan, scientifically substantiated through the PE and that meets the real needs of the client, as in hospital units, these professionals are taking care of critical patients and critics, mainly post-reanimated PCR, in which are high rates of morbidity and mortality and of patients who survive, many left with neurological sequelae.⁴

In this sense, one of the treatments used able to improve the patient's prognosis that lies in this emergency situation, isHT, that This included the recommendations of the International Liaison Committee on Resuscitation (ILCOR) of 2003 and 2010, as well as on the guidelines of the American Heart Association regarding advanced care in Cardiology

(ACLS) as being equally effective and safe,⁵ which is regarded as a controlled reduction of central temperature of patients with pre-defined therapeutic goals.⁶

This therapy can be classified into three types: mild hypothermia (34°C to 32°C), moderate hypothermia (32°C to 28°C) and severe hypothermia (less than 28°C). These levels can be considered stages, however recent clinical papers emphasize that the ideal temperature to obtain the desired therapeutic effect would be between 32°C to 34°C.⁷

In this scenario, a study published in 1997 induced hypothermia (33°C) in 22 patients admitted to emergency victims of cardiac arrest, where the external cooling was carried out and maintained for 12 hours in an intensive care unit (ICU). "When you perform the comparison with Group of patients who have not undergone this therapy, showed that the mortality rates decreased from 77% to 45%, for the group that underwent this treatment."⁶

However, such conduct therapy, can present numerous potential complications in which the nurse, professional assisting this patient and care Manager, must have insight to identify these possible complications, because the assistance provided should be intermittent and continuous as well as encompass the entire complex of risk that this patient might have.

In this perspective, to guide this study, formulated the following guiding question: what are the nursing diagnoses and interventions against the potential complications of patient subjected to hypothermia therapy? To answer it drew up the following objectives: identify nursing diagnoses, according to the *North American Nursing Diagnosis Association* (NANDA), subject to the potential complications of patients undergoing therapeutic hypothermia cardiopulmonary post-arrest through a Bibliometric study; and propose nursing interventions, as the nursing Interventions classification (NIC).

METHOD

This study developed from the perspective of a Bibliometric review of literature from January 2003 until May 2013. This review is in surveying the bibliography of secondary sources that have published in magazines, books, articles, newspapers, and paper publications. Puts the researcher in the face of everything that ever been written about a particular subject and, allows you to not only define and solve problems already known, as well as explore new ways and new areas on the subject.⁸

The established research site was the database of Virtual Health Library (VHL), where the databases were selected from Latin American Literature of medical sciences (LILACS), the Medical Literature Analysis and Retrieval System Online (MEDLINE) and Scientific Electronic Library Online (SCIELO), because, in an initial survey, it was found that these bases had a significant amount of publications with the theme proposal.

For the collection of research data, they settled for the selection of articles, descriptors belonging to the health sciences descriptors (DeCS), which were used, namely: Induced Hypothermia; Therapeutic hypothermia in cardiac arrest; Induced hypothermia in

cardiac arrest; Hypothermia in cardiac arrest. In a moment, coupled with key words: nursing processes; nursing; nursing care; nursing diagnosis; and nursing in emergency.

Given this, established the following criteria for inclusion: publications in Portuguese and nursing and medical area, complete texts, published between the periods from January 2003 to May 2013, to highlight the therapeutic hypothermia cardiopulmonary post-arrest theme. Thus, foreign-language publications excluded, which showed only the summary, which attended the purpose of research, as well as identical articles published in different journals.

For analysis of the publications cataloged, the authors dedicated themselves to examine diagnostic taxonomy proposed by the *North American Nursing Diagnosis Association* (NANDA), in its version 2012-2014. The taxonomy II is composed of three levels: domains, classes and nursing diagnoses, where domain refers to a "sphere of knowledge, influence, and questioning" and a class consists of "a group, set, or type that share common attributes."⁹

Thus, the authors of possession of potential complications of patient subjected to HT post-PCR correlated the information obtained to the appropriate domain, and then the class, in order to infer possible clinical trials and therefore nursing diagnoses. In a subsequent, presented a proposal to interventions of nursing based on nursing interventions Classification (NIC).¹⁰

After analysis, it was possible to combine some complications and, in this way, the results presented in five tables, which contemplated the nursing diagnoses to complication identified in articles, with their respective nursing interventions.

RESULTS E DISCUSSION

The survey obtained through the application of descriptors 14.598 publications in the Virtual Health Library (VHL), which is a base of scientific and technical information cooperatively to facilitate broad access to permanent information and contributes to the literature on healthcare research.

However, when applied the inclusion criteria, the total numbers of publications selected for the survey reduced to five articles. Of this total, all contained in its composition possible complications of HT, however did not show any nursing care based on scientific methodology, by NANDA taxonomy, discharged to this client.

The complications highlighted in articles were: nosocomial pneumonia; cardiac arrhythmias; sepsis, infection, epileptic status; hyperthermia rebound; coagulopathies; pressure skin lesions; frostbite and; hypomagnesaemia, hypophosphatemia and hypocalcemia.

Based mentioned complications, reached eight nursing diagnoses, some complications allowed to list more than one diagnosis.

Front of Nosocomial Pneumonia, as a possible complication of HT, noted in table 1, the nursing diagnosis "impaired gas Exchange, characterized by carbon dioxide decreased, abnormal arterial blood gases and hypoxia, related to ventilation-perfusion ratio imbalance", with their respective nursing interventions.

Table 1 - Nursing diagnosis about Nosocomial Pneumonia as a potential complication of HT, with their respective nursing interventions. Brazil: 2013

NURSING DIAGNOSES	-Impaired gas Exchange, characterized by carbon dioxide decreased, abnormal arterial blood gases, and hypoxia, related to ventilation-perfusion ratio imbalance. * Impaired spontaneous ventilation, characterized by PO decreased metabolic factors related ² .
NURSING INTERVENTIONS	-Monitor the fan parameters routinely; -Regularly check all connections of the fan; -Monitor factors that increase O ₂ consumption (fever, tremor, convulsions) able to bypass the fan settings and cause a desaturation of O ₂ ; -Keep airway clear, through the tracheal aspiration as peculiar need the patient, using aseptic techniques; -Monitor the patient's respiratory secretions; -Listen lung sounds as the crackles or other adventitious noises; -Keep head of bed elevated, if there is no contraindication; -Promote proper oral hygiene;

* Diagnosis assigned due to the patient subjected to invasive mechanical ventilation.

Arrhythmias and coagulopathies were cited as possible complication associated with HT and, after interpretation of the mechanism of action of therapeutic, it was possible to highlight how nursing diagnosis: "decreased cardiac output, characterized by arrhythmia and systemic vascular resistance, increased heart rate and related post charge changed" as well as "risk of cerebral tissue perfusion related to ineffective, coagulopathy and treatment-related side effects" and nursing interventions for such diagnoses as table 2.

Table 2 - Nursing diagnosis about cardiac arrhythmia and coagulopathy as a potential complication of HT, with respective nursing interventions. Brazil: 2013

NURSING DIAGNOSES	Cardiac output decreased, characterized by arrhythmia and systemic vascular resistance, increased heart rate, and related altered afterload. Risk of cerebral tissue perfusion related to ineffective, coagulopathy and treatment-related side effects.
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NURSING INTERVENTIONS	<ul style="list-style-type: none">-Monitor heart rate and rhythm, as well as the laboratory values for electrolytes that can increase the risk of arrhythmias (such as serum potassium and magnesium) and vital signs frequently;-To listen to heart sounds;-Register cardiac arrhythmias;-Observe signs of decreased cardiac output;-Evaluate the patient's response against arrhythmias;-Monitor the size, shape, symmetry and pupillary reaction;-Monitor level of consciousness, Glasgow Coma scale, invasive hemodynamic parameters, corneal reflex;-Monitor the occurrence of visual disturbances, tremors and paresthesia;-Notify the doctor faced with change in the patient's condition;
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In case that the patient's rewarming submitted to HT, identified in articles hyperthermia rebound as well as *status epileptics* as a possible complication of therapy and should be immediately identified, as can rekindle the patient's brain injury, in addition to greatly increase oxygen consumption. Thus, it evidenced as nursing diagnosis: "ineffective Thermoregulation, characterized by an increase in body temperature above the normal parameters and tremors" and sequentially assigned nursing interventions, contained in table 3.

Table 3 - Nursing diagnosis about hyperthermia rebound and *status epilepticus* as a potential complication of HT, with their respective nursing interventions. Brazil: 2013

NURSING DIAGNOSIS	<ul style="list-style-type: none">-Term regulation ineffective, characterized by increase in body temperature above the normal parameters and tremors.
NURSING INTERVENTIONS	<ul style="list-style-type: none">-Monitor the temperature with adequate frequency;-Establish continuous monitoring central temperature as appropriate;-Monitor the convulsive activity;-Monitor the acid/base imbalance;-Monitor the occurrence of electrolyte imbalance;-Monitor color and skin temperature;

During HT, is possible to pressure skin lesions and frostbite as potential complications of therapy. In front of it stands out the "risk of impaired skin integrity related to hypothermia, impaired metabolic State, immunological factors and medications" and "risk of thermal injury related to treatment side effects and exposure to extremes of temperature" as a possible nursing diagnosis, and it is up to the professional nurse interventions for prophylaxis and/or recovery of this (table 4).

Table 4 - Nursing diagnosis about pressure skin lesions and frostbite as a potential complication of HT, with their respective nursing interventions. Brazil: 2013.

NURSING DIAGNOSES	Risk for impaired skin integrity related to hypothermia, impaired metabolic State, immunological factors and medications. Risk of thermal injury related to treatment side effects and exposure to extremes of temperature.
NURSING INTERVENTIONS	-Monitor the patient's risk factors through the Braden Scale; -Monitor the emergence of sources of pressure and friction; -Apply protective barriers, to remove excessive moisture; -Moisturize dry skin and compact; -Apply to bony prominences protectors; -Perform decubitus change every one or two hours, depending on hemodynamic stability. -Evaluate the general condition, safety and comfort during treatment; -Monitor color and skin temperature; -Do complete evaluation of peripheral circulation; -Assess peripheral edema and pulses; -Examine the skin in search of tissue rupture;

The patient referred to HT can present potential complication, hypomagnesaemia, hypophosphatemia, and hypocalcemia, because the intracellular flows cause cooling of these ions. Thus, in table 5, it was possible to infer the nursing interventions nursing diagnosis: "risk of electrolyte imbalance, secondary effects related to treatment, and regulatory mechanisms impaired."

Table 5 - Nursing diagnosis about hypomagnesaemia, hypophosphatemia, and hypocalcemia as a potential complication of HT, with their respective nursing interventions. Brazil: 2013.

DIAGNOSIS OF ENENENFERMAGEM	Risk of electrolyte imbalance, secondary effects related to treatment and regulatory mechanisms impaired.
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NURSING INTERVENTIONS	<ul style="list-style-type: none">-Monitor abnormal levels of serum electrolytes;-Monitor the occurrence of neurological manifestations, through the GCs and Ramsay;-Obtain samples of the levels of calcium, magnesium and potassium for laboratory analysis, as Protocol;-Identify possible causes of electrolyte imbalance;-Recognize and report the presence of electrolyte imbalance;-Administer supplemental electrolytes as medical prescription;-Monitor the sufficiency of renal patients receiving replacement of these electrolytes through rigorous water balance;-Monitor the occurrence of pulmonary, cardiovascular and gastrointestinal manifestations and hemodynamic condition;-Provide continuous cardiac monitoring;
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Although the ILCOR suggest the HT post-PCR Protocol, it observed that there was no concern to make a Protocol against the potential complications that these patients may develop. In this sense, the nurse, whose role in the recovery of the individual is of fundamental importance, should develop a plan of care systematically, in order to prevent such complications as well as facilitate the recovery of the patient.

Among the complications, nosocomial pneumonia, was shown in a prospective observational study of patients undergoing HT after PCR, in an intensive care unit for 10 months.¹¹

It is known that the patient who is in an emergency situation within the framework of intensive therapy, has numerous invasive devices insertion and is subjected to a series of routine procedures and it is also believed that this complication, is associated with decreased immunity caused by hypothermia, which makes the patient susceptible to two other complications highlighted, infection and sepsis.

In this context, it is incumbent upon the orderly, fundamental piece in the handle, be in constant interaction with the education process in service, aiming to guide their actions to better serve patients and promote strategies of transformations in the scenery of the assistance.

Arrhythmias are associated with hypomagnesaemia, hypophosphatemia and hypocalcemia, because cooling causes intracellular flux of magnesium, potassium, calcium and phosphate, resulting in abnormally low serum levels of these ions and thus the electrolytic disorders are regulars since hypothermia changes the Ionic homeostasis and causes a tubular dysfunction.¹²

Therefore, the nurse should be aware of the parameters of normality of these ions, and accurately interpret arterial blood gases of those customers, in search of any change, since such arrhythmias increases the risk of Ventricular Fibrillation (VF) and consequently the chances if there is a new episode of PCR.

Another possible complication is the hyperthermia rebound because it is associated with adverse outcomes in patients post-PCR and, from this perspective, the patient's rewarming submitted to HT, should always be slow and passive (not more than 0.5° C/h), in order to prevent the re-injury and aggravation of cerebral edema.¹³

Front of it, study published in 2009, in the journal of Intensive Therapy, highlights that the axillary temperature should not, under any circumstances, and be used as parameters for cooling or heating decision.⁶

As for the *status epileptics*, aggravates independently the neurological damage and can occur without motor translation, given the persistence of coma and should be treated aggressively (phenytoin, phenobarbital and sedatives) and with eventual Electroencephalographic monitoring continuous.¹⁴

After the cardiac resuscitation there is increased activity post-thrombosis and overall decrease of factors anticoagulants (Antithrombin III, protein C and S), being these changes more marked in patients who die in the first couple of days, due to bleeding disorders and, in this sense, the use of thrombolytic therapy for the refractory, PCR increases the number of patients with hemodynamic recovery.¹³

The pressure skin lesions, as well as frostbite, require performance of nursing staff, whether in the prevention, control or treatment of the same, however it should be noted that for effectiveness of expertise, scientific, technical knowledge is required concerning the assessment of the patient as a whole, considering themselves as for signs of instability that this patient might have.

Coupled with scientific technical expertise, the nurse has a methodological instrument able to guide their actions, PE, that understood as a systematic method of Humanized care.³

Nursing diagnoses are fundamental elements of the EP, as the accuracy and relevance of all the prescription of care depends on your ability to identify, clearly and specifically, both the problems and their causes.

In this study, among those identified according to taxonomy II of NANDA, 50% refers to diagnosis of risk, namely: risk of Cerebral Tissue Perfusion Ineffective, risk of impaired skin integrity, risk of Thermal Injury and risk of electrolyte imbalance.

In this way, only by means of the clinical trial, it becomes possible to predict risk diagnoses and therefore plan care that promote health and prevent complications.

Regarding the interventions listed, according to NIC, mainly refers to the dimension of monitoring, which allows highlighting that nursing is the link between the multidisciplinary team, since, by monitoring it is possible to prevent damage to health care.

CONCLUSION

Currently, is known that patients undergoing cardiopulmonary post-arrest therapeutic hypothermia treatment have a better prognosis, as well as protection of brain tissue by reducing cerebral oxygen demand.¹⁵

However, despite the high effectiveness of HT in reducing the extent of neurological damage post-PCR, its use is not as broad in practice, mainly because of the lack of structure of hospitals and lack of improvement of professionals regarding their use.

In this sense, the process of work **watching** the nurse should aligned with the current therapeutic interventions, in order to establish a plan of care consistent with the real needs of the client, through the application of the nursing process.

It is known that the nursing process promotes "order and a direction to nursing care, being the essence, the instrument and the methodology of nursing practice, helping the nurses make decisions, predict and evaluate the consequences." ¹⁶

With this research, it was possible to identify, by means of selected articles, eight subsidized nursing diagnoses in the potential complications of HT, as well as their respective nursing interventions, in order to serve as initial allowance for critical reflection of nurses against decision-making during nursing care to this patient.

With regard to the limitations of this study refers to the sample, due to the number of articles and books that discuss the subject, as well as issues related to HT still requires further investigation, as for example, the tolerable range for beginning of induction, cooling speed, the ideal methods for induction, the speed of cooling and maintenance of hypothermia, supporting drug use, and ideal duration level and finally, the reheating process.

It should be noted that the research despite having focused on only two of the five steps of the nursing process, points out that this process is sequential, inter-related and concomitant form occurs, consistent with the development of the profession, as it assists the nurse in the health care practice, thus encouraging concrete care and a perfect organization of the necessary conditions.

Therefore, it is appropriate to recall the need for preparation of nurses, as well as the team that participates in the process of patient care post-PCR submitted to HT, requiring studies, guidelines, and training in this area of care.

Finally, we highlight that "professional autonomy will only be achieved when all class start using this scientific methodology, i.e. when in practice the systematic application of the nursing process." ¹⁷

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Received on: 20/01/2014
Required for review: No
Approved on: 31/07/2014
Published on: 01/10/2014

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